

WHAT IS CLAIMED IS:

1. An ink jet printing apparatus to form an image
on a print medium by ejecting ink onto the print
5 medium from a plurality of nozzles arrayed in a print
head, the printing apparatus comprising:

a recovery means to recover a normal ink ejection
state of each nozzle in the print head; and

recovery operation determining means for dividing
10 the nozzles into a plurality of blocks, counting the
number of ejections from the nozzles in each block and,
based on the accumulated number of ejections for each
block, determining whether or not to execute a
recovery operation of said recovery means.

15

2. An ink jet printing apparatus as claimed in
claim 1, wherein said recovery operation determining
means determines to execute the recovery operation on
the print head when at least one of the accumulated
20 numbers of ejections for the individual blocks reaches
a predetermined threshold.

3. An ink jet printing apparatus as claimed in
claim 2, wherein the predetermined threshold is a
25 value that differs from one block to another.

4. An ink jet printing apparatus as claimed in

claim 2, further comprising:

an accumulated ejection number correction means to correct by a weighting value the accumulated number of ejections counted for each block;

5 wherein said recovery operation determining means compares the accumulated numbers of ejections corrected by said accumulated ejection number correction means with the predetermined threshold.

10 5. An ink jet printing apparatus as claimed in claim 4, wherein said accumulated ejection number correction means increases the weighting value as the position of the associated nozzle block is farther away from an ink supply port of the print head and
15 multiplies the accumulated number of ejections by the associated weighting value to correct the accumulated number of ejections.

20 6. An ink jet printing apparatus as claimed in claim 4, wherein the weighting value is changed according to a temperature in the ink jet printing apparatus.

25 7. An ink jet printing apparatus as claimed in claim 6, wherein the weighting value is increased as the temperature in the ink jet printing apparatus rises.

8. An ink jet printing apparatus as claimed in claim 1, wherein the recovery operation includes an operation of moving ink in the print head.

5

9. An ink jet printing apparatus as claimed in claim 8, wherein the recovery operation includes a preliminary ejection for ejecting ink not involved in a printing operation from each nozzle.

10

10. An ink jet printing apparatus comprising:

a print head control means to control a print head having a plurality of nozzles for ejecting ink according to print data;

15 a print head recovery means to recover a normal ink ejection state of each nozzle in the print head;

recovery operation determining means for deciding whether or not to execute a recovery operation of said print head recovery means; and

20 an accumulated print dot number counter to divide the nozzles of the print head into a plurality of blocks and count the accumulated number of print dots transferred to each block;

wherein said recovery operation determining means
25 determines, based on a value of the accumulated print dot number counter, whether or not to execute the recovery operation of said print head recovery means.

11. An ink jet printing apparatus as claimed in claim 10, further comprising:

5 a weighting means to apply different weights to the values of said accumulated print dot number counters of the different blocks;

wherein said recovery operation determining means determines, based on a result of the weighting, whether or not to execute the recovery operation.

10

12. An ink jet printing apparatus as claimed in claim 10, wherein the weight applied by said weighting means is based on a structure of a liquid chamber in the print head.

15

13. An ink jet printing apparatus to form an image on a print medium by using a print head, wherein the print head includes a plurality of nozzles for ejecting ink, an ink supply port to receive a supply of ink, a liquid chamber to deliver the supplied ink to the nozzles, and a plurality of nozzle heaters provided one in each nozzle to heat the ink and thereby form a bubble in ink in each nozzle to eject the ink by a pressure of the expanding bubble, the printing apparatus comprising:

25

a print head recovery means to recover a normal ink ejection state of each nozzle in the print head;

recovery operation determining means for
determining whether or not to execute a recovery
operation of the print head recovery means; and

an accumulated print dot number counter to divide
5 the nozzles of the print head into a plurality of
blocks and count the accumulated number of print dots
transferred to each block;

wherein said recovery operation determining means
determines, based on a value of the accumulated print
10 dot number counter, whether or not to execute the
recovery operation.

14. An ink jet printing apparatus as claimed in
claim 13, wherein a target accumulated print dot
15 number, on which is based a decision to execute the
recovery operation, is set large for blocks near the
ink supply port.

15. An ink jet printing apparatus as claimed in
20 claim 1, wherein a direction in which the ink is
ejected from the nozzles is almost vertical.

16. An ink jet printing apparatus as claimed in
claim 1, having a plurality of the print heads.

25

17. An ink jet printing apparatus comprising:
a print head recovery means to recover a normal ink

ejection state of each nozzle in the print head;

a memory means to store the accumulated number of print dots printed by each of the nozzles; and

recovery operation determining means for setting
5 different target print dot numbers to different
nozzles and checking if the accumulated number of
print dots printed by each of the nozzles has reached
the corresponding target print dot number, in order to
determine whether or not to execute the recovery
10 operation of the print head recovery means.

18. An ink jet printing apparatus as claimed in
claim 17, wherein the target print dot number, on
which is based a decision to execute the recovery
15 operation, is set large for nozzles near the ink
supply port.

19. An ink jet printing apparatus as claimed in
claim 17, wherein, when the target print dot number,
20 on which is based a determination to execute the
recovery operation, is set large for a central portion
of the print head and small for end portions of the
print head.

25 20. A print head recovery method for recovering a
normal ink ejection state of each of nozzles in the
print head used in an ink jet printing apparatus,

wherein the ink jet printing apparatus forms an image on a print medium by ejecting ink onto the print medium from a plurality of nozzles arrayed in the print head, the print head recovery method comprising:

5 a recovery operation determining step which divides the nozzles into a plurality of blocks, counts the number of ejections from those nozzles making up each block and, when at least one of the accumulated ejection numbers counted for the individual blocks
10 reaches a predetermined threshold, decides to execute the recovery operation.

21. A printing apparatus to form an image on a print medium by ejecting ink onto the print medium
15 from a plurality of nozzles arrayed in a print head, the printing apparatus comprising:

a print head recovery means to recover a normal ink ejection state of the print head having the plurality of nozzles for ink ejection; and

20 recovery operation determining means for determining whether or not to execute a recovery operation of the print head recovery means, based on the accumulated number of ejections from predetermined nozzles in the print head.

25

22. A printing apparatus as claimed in claim 21, further comprising:

means for executing the recovery operation of the print head recovery means when the accumulated number of ejections reaches a predetermined value.

- 5 23. A printing apparatus as claimed in claim 21, further comprising:

means for executing the recovery operation when the accumulated number of ejections from one of the predetermined nozzles reaches a predetermined value.

10

24. A printing apparatus as claimed in claims 21 to 23, wherein the predetermined value differs from one of the predetermined nozzles to another.